CLAIMS

1. Method for the selective assembly of proteins into a structure comprising:
-a first step of the inclusion of a first partial protein sequence –GYG- into a further protein sequence, the further sequence forming a loop structure in the native state,
- a second step of the addition of metal ions to thereby form the selective assembly.

2. The method according to claim 1, wherein the metal ions are alkali metal ions.

3. The method according to claim 1, wherein the metal ions are selected from the group of metal ions consisting of lithium, sodium and potassium ions.

4. The method according to claim 1, wherein the metal ions are alkaline earth metal ions.

5. The method according to claim 1, wherein the metal ions are selected from the group of metal ions consisting of magnesium and calcium ions.

6. The method according to claim 1, wherein the metal ions are transition metal ions.

7. The method according to claim 1, wherein the metal ions are selected from the group of transition metal ions consisting of copper, zinc and iron ions.

8. The method of claim 1, wherein the first partial protein sequence –GYG- is in an all-gauche conformation.

9. The method according to any of the above claims, wherein the metal ions are in any ionisation state.

10. The method according to any one of the above claims, wherein the first protein partial sequence is a member of a second partial protein sequence –GGYGG-.

11. The method according to claim 10 in which one of the glycine molecules in the second partial protein sequence is substituted with another amino acid.

12. The method according to any of the above claims, wherein the first partial sequence is part of a fibrous protein.

13. The method according to any one of the above claims wherein the first partial protein sequence is part of a protein selected from the group of proteins consisting of fibroin, spidroin and fibronectin.

14. Use of a first partial protein sequence –GYG- as part of a loop structure sequence to selectively assemble a protein into a structure on introduction of metal ions, the metal ions being present in an aqueous medium.

15. The use according to claim 14, wherein the metal ions are potassium ions.

16. The use according to claim 14, wherein the metal ions are heavy metal ions

17. The use according to claim 14, wherein the metal ions are transition metal ions.

18. The use according to claim 14, wherein the metal ions are actinides.

19. The use according to any one of claims 14 to 18, wherein the metal ions are in any ionisation state.

20. Macromolecular molecule manufactured using the method of one of claims 1 to 13.

21. A combination of a protein solution of a protein having at least a –GYG- partial protein sequence and an apparatus for forming a selective assembly from the protein solution, the apparatus including at least one passage (17) though which the protein solution is passed; at least one compartment (9, 14) storing an ion solution having metal ions; and a contact area (12) in which the protein solution and the ion solution are brought into contact to thus form the selective assembly.

22. The combination of claim 21, wherein the at least one passage (17) is separated from the at least one compartment (9, 14) by a wall made of semipermeable or porous material.

23. The combination of claim 22, further having at least two compartments (9, 14) isolated from each other, a first one of said compartments (9) surrounding a first portion (8) of the wall and defining an inlet portion of at least one passage (17) and a second one of said compartments (14) surrounding a second portion (12) of said wall defining an outlet portion of the at least one passage (17).

24. The combination of any one of claims 21 to 23, wherein each of said compartments (9, 14) has supply and removal means (10, 11; 15, 16) for supplying ion solution to, and removing ion solution from, the compartment.

25. The combination of any one of claims 21 to 24, characterised in that the cross-sectional area of said inlet portion of the at least one passage (17) increases towards the outlet portion.

26. The combination of any one of claims 21 to 24, wherein the cross-sectional area of said inlet portion of the at least one passage (17) decreases towards said outlet portion.

27. The combination of claim 26, wherein the diameter of the inlet portion decreases substantially towards the outlet portion.

28. The combination of any one of claims 21 to 27 wherein the inner surfaces of said walls of the at least one tubular passage (17) are coated with friction reducing material.

29. The combination of any one of claims 21 to 28 wherein concentrically arranged feed means are positioned at the inlet end of the at least one tubular passage (17) to supply said protein solution to the passage (17).

30. The combination of any one of claims 22 to 29 wherein said semipermeable and/or porous material comprises cellulose acetate-based material, or substituted

diethylaminoethyl, carboxyl, or carboxymethyl groups.

31. The combination of any one of claims 22 to 29, wherein said semipermeable material and/or porous material comprise hollow-fibre membranes of polysulfones, polyethyleneoxide-polysulfone blends, silicone or polyacrylonitrile.

32. The combination of anyone of claims 21 to 31 further including supply means (2, 3) for supplying the protein solution to the at least one passage (17) and removal means (5) for removing the formed material from the contact area.

33. The combination of any one of claims 21 to 32, wherein the metal ions are alkali metal ions.

34. The combination of any one of claims 21 to 32, wherein the metal ions are alkaline earth metal ions.

35. The combination of any one of claims 21 to 32, wherein the metal ions are selected from the group of transition metal ions consisting of copper, zinc and iron ions.

36. The combination of any one of claims 21 to 35, wherein the first partial sequence –GYG- is in an all-gauche conformation in the native state.

37. The combination of any one of claims 21 to 36, wherein the first partial sequence is a member of a second partial sequence –GGYGG.

38. The combination of claim 37 in which one of the glycine molecules in the second partial sequence is substituted with another amino acid.

39. The combination of any one of claims 21 to 38 in which the protein solution is a solution of a fibrous protein.